Rocky Flats Plant

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Monthly Environmental Monitoring Report

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August Issues

Summarized below are highlights from the major data categories presented. Remaining data presented in this report are within the ranges historically measured for their respective parameters and locations.

August 1992 Monitoring Data - Environmental monitoring data for the month of August is limited because of ongoing technical difficulties experienced by the Radiological Health Laboratory at Rocky Flats Plant (RFP). The laboratory was shut down by the Waste Engineering Department of EG&G Rocky Flats on June 2, 1992, because of problems with the laboratory's aqueous waste transfer system. A leak into the secondary containment of that system led to the identification of the need for upgrades to the secondary containment. Repair work was initiated and largely completed, and a Contingency Plan was filed with the Colorado Department of Health (CDH) under which the laboratory returned partial operational status in early July. However, on July 31, 1992, a sump pump used for transfer of laboratory aqueous process wastes failed, resulting in suspension of laboratory electroplating operations. On August 4, 1992, a leak test of aqueous process waste lines identified other leaks in the system, and all laboratory analyses that would generate aqueous process waste were suspended. Repairs on these lines were completed mid-September, and the laboratory has resumed limited operation for analyses. However, the date by which normal laboratory operations may resume remains uncertain. Continued delays in reporting analytical results for environmental monitoring samples are expected.

Late in August 1992, the General Laboratory of RFP also was shut down because of concerns with the secondary containment of the laboratory's aqueous process waste systems. Samples for nonradioactive parameters taken under the RFP National Pollutant Discharge Elimination System (NPDES) permit and normally analyzed in the General Laboratory were shipped to offsite contract laboratories for analyses. Table 14 of this report details metals results for samples collected at the Sewage Treatment Plant (STP) during August 1992. Detection levels for cadmium and silver at offsite labs were somewhat higher than those of our onsite laboratories. These metals data are provided for informational purposes, and no permit limitation has been set for them. Previous data for these metals have regularly shown non-detectable levels at our onsite laboratories.

Total long-lived alpha and beta activity screening, performed on air effluent sample filters and surface water discharge samples prior to radiochemical processing and analysis, has not been affected by the difficulties with the Radiological Health Laboratories, and is continuing on schedule. The results of this screening for August are within normally expected ranges.

Rocky Flats Plant Environmental Monitoring Report

1. Introduction

The Rocky Flats Plant (RFP) has been part of a nationwide Department of Energy (DOE) complex for the research, development, and production of nuclear weapons. The plant was responsible for fabricating nuclear weapons components from plutonium, uranium, beryllium, and stainless steel. The primary production activities included metal fabrication and assembly, chemical recovery and purification of process-produced transuranic radionuclides, and related quality control functions.

This mission changed with the announcement in early 1992 that certain planned weapons systems had been canceled. RFP no longer produces weapons components, and is now in a transition phase into decontamination and disposition (D&D). Primary objectives of this new mission include achieving and maintaining compliance with environmental regulatory requirements, as well as effecting proper D&D steps that are under development.

Because radioactive and chemically hazardous materials may be used or handled at RFP during transition, the plant maintains an extensive environmental protection program. Included in that program is regular monitoring for radioactive and hazardous constituents at onsite, plant boundary, and offsite locations.

This Monthly Environmental Monitoring Report summarizes the effluent and environmental monitoring programs at the RFP for August 1992. Data presented herein reflect the best information available to the RFP at this time. If subsequent analyses indicate that any data presented herein are inaccurate or misleading, revisions will be issued promptly.

Summarized in the Executive Summary are highlights from the major data categories presented. Remaining data presented in this report are within the ranges historically measured for their respective parameters and locations.

Radiation standards for protection of the public are discussed in Appendix A of this report. The primary standards are based

on calculations of radiation dose. These calculations are performed annually using monitoring data presented in the Monthly Environmental Monitoring Report. Radiation doses to the public from RFP operations are typically well below any regulatory limit and far less than are received from naturally occurring radiation sources in the Denver metropolitan area.

Appendix B lists the Volatile Organic Compounds (VOCs) for which monitoring is required under the National Pollutant Discharge Elimination System/Federal Facilities Compliance Agreement (NPDES/FFCA). Appendix C describes Colorado Water Quality Control Commission standards for the Walnut Creek and Woman Creek drainages downstream of RFP.

Error terms in the form of "a$\pm$b" are included with some of the data. For a single sample, "a" is the analytical-blank corrected value; for multiple samples it represents the arithmetic mean, the volume-weighted mean, or the annual total, as indicated in the table. The error term "b" accounts for the propagated statistical counting uncertainty of the sample(s) and the associated analytical blanks at the 95 percent confidence level. These error terms represent a minimum estimate of error for the data.

Plutonium, uranium, americium, tritium, and beryllium measured concentrations are given in this report. Most of the measured concentrations are at or very near background levels, and often there is little or no amount of these materials in the media analyzed. When this occurs, the results of the laboratory analyses can be expected to show a statistical distribution of positive and negative numbers near zero and numbers that are less than the calculated minimum detectable concentration for the analyses. The laboratory analytical blanks, used to correct for background contributions to the measurements, show a similar statistical distribution around their average values. Negative sample values result when the measured value for a laboratory analytical blank is subtracted from a sample analytical result smaller than the analytical blank value. Results that are less than calculated minimum detectable levels indicate that the results are below the level of statistical confidence in the actual numerical values. All reported results, including negative values and values that are

less than minimum detectable levels, are included in any arithmetic calculations on the data set. Reporting all values allows all of the data to be evaluated using appropriate statistical treatment. This assists in identifying any bias in the analyses, allows better evaluation of distributions and trends in environmental data, and helps in estimating the true sensitivity of the measurement process.

The reader should use caution in interpreting individual values that are negative or less than minimum detectable levels. A negative value has no physical significance. Values less than minimum detectable levels lack statistical confidence as to what the actual number is, although it is known with high confidence that it is below the specified detection level. Such values should not be interpreted as being the actual amount of material in the sample, but should be seen as reflecting a range (from zero to the minimum detectable level) in which the actual amount would likely lie. These values are significant, however, when taken together with other analytical results that indicate that the distribution is near zero.

The data in this report are provided as a matter of courtesy and should not be construed as an application for a permit or license, or in support of such an application. Approval of the DOE should be obtained before publication of any data contained in this report.

Abbreviations used within this report are as defined.

Abbreviations

C Average	Average concentration
C Maximum	Maximum concentration
C Minimum	Minimum concentration
m^3	Cubic meter
m/s	Meters per second
mCi	Millicurie
mg/l	Milligrams per liter
mrem	Millirem
pCi/l	Picocuries per liter
pCi/m^3	Picocuries per cubic meter
p H	Hydrogen ion concentration
S U	Standard Unit
$\mu g/m^3$	Micrograms per cubic meter
#/100 ml	Number per 100 milliliter
µCi	Microcurie

2. Air

2.1 Airborne Effluent

RFP continuously monitors radionuclide air emissions at 53 locations in 17 buildings. The requirements outlined in the General Environmental Protection Programs (DOE Order 5400.1) and the National Emission Standards for Emissions of Radionuclides Other Than Radon From DOE Facilities (40 CFR 61, Subpart H), mandate the continuous monitoring of air emissions at all release points with the potential of discharging radionuclides into the air in quantities that could result in an effective dose equivalent greater than 0.1 millirem per year.

The radiological particulate monitoring and sampling program uses a three-tier approach comprising Selective Alpha Air Monitors (SAAMs), total long-lived alpha screening of routine air duct emission sample filters, and radiochemical analysis of isotopes collected from air duct emission samples. This approach balances both sensitivity and timeliness of desired results. Figure 1 shows a typical radiological emission sampler configuration within an exhaust duct at the RFP.

For immediate detection of abnormal conditions, RFP building ventilation systems that service areas containing plutonium are equipped with SAAMs. SAAMs are sensitive to specific alpha particle energies and are set to detect plutonium-239 and -240. These detectors are subjected to daily operational checks, monthly performance testing and calibration for airflow, and an annual radioactive source calibration to maintain sensitivity and reliability. Monitors alarm automatically if out-of-tolerance conditions are experienced.

At regular intervals, particulate material samples from a continuous sampling system are removed from each exhaust system and radiometrically analyzed for long-lived alpha and beta emitters. The concentration of long-lived alpha and beta emitters is indicative of effluent quality and overall performance of the High Efficiency Particulate Air (HEPA) filtration system. If the total long-lived alpha concentration for an effluent sample exceeds the RFP action value of 0.020×10^{-12} microcuries per milliliter, a follow-up investigation is conducted to determine the cause and to evaluate the need for corrective

action. The action value is equal to the most restrictive offsite Derived Concentration Guide (DCG) for plutonium activity in air.

At the end of each month, individual samples from each exhaust system are composited by location. An aliquot of each dissolved composite sample is analyzed for beryllium particulate materials. The remainder of the dissolved sample is subjected to radiochemical separation and alpha spectral analysis that quantifies specific alpha-emitting radionuclides. Analyses for uranium isotopes are conducted for each composite sample.

Forty-one of the ventilation exhaust systems are located in buildings where plutonium processing is conducted. Particulate material samples from these exhaust systems are analyzed for specific isotopes of plutonium and americium. Typically, americium contributes only a small fraction of the total alpha activity release from RFP.

Processes ventilated from several exhaust systems potentially exhibit trace quantities of tritium contamination. Impingers-type samplers are used to collect samples three times each week from the monitored locations. Tritium concentrations in the sample are measured using a liquid scintillation photospectrometer.

Tables 1 through 3 show monitoring results for radioactive and nonradioactive airborne effluents continuously sampled from plant buildings.

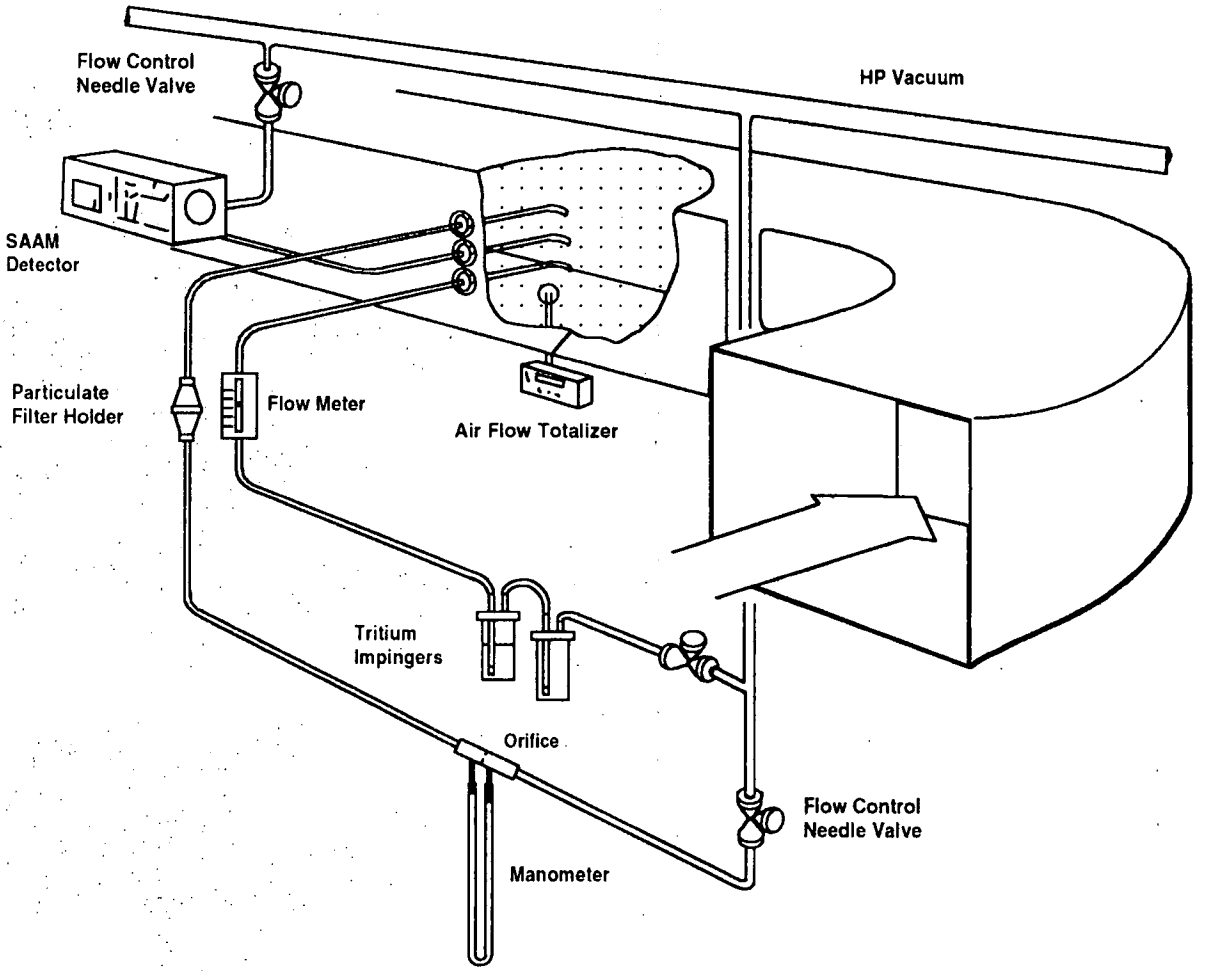


Figure 1: Radiological Effluent Air Sampling System

Table 1

Plutonium and Americium Airborne Effluent Data

Month	Plutonium-239, -240 (07/13/92 - 08/13/92) Release (μCi)	C Maximum (pCi/m³)	Americium-241 (06/15/92 - 07/13/92) Release (μCi)	C Maximum (pCi/m³)
1991				
Year to Date	0.843 ± 0.167	0.0030 ± 0.0006	0.1500 ± 0.0680	0.0006 ± 0.0001
1992				
January	0.031 ± 0.011	0.0005 ± 0.0001	0.0103 ± 0.0056	0.0003 ± 0.0001
February	0.024 ± 0.007	0.0002 ± 0.0000	0.0090 ± 0.0061	0.0003 ± 0.0001
March	0.026 ± 0.006[a]	0.0002 ± 0.0001[a]	0.024 ± 0.005[b]	0.0012 ± 0.0002
April	0.023 ± 0.007[c]	0.0001 ± 0.0000	[d]	[d]
May	[d]	[d]	[d]	[d]
June	[d]	[d]	[d]	[d]
July	[d]	[d]	[d]	[d]
August	[d]	[d]		

a Nine locations missing because of incomplete laboratory analysis.
b Six locations missing because of incomplete laboratory analysis.
c Four locations missing because of incomplete laboratory analysis.
d Incomplete laboratory analysis.

Table 2

Uranium Airborne Effluent Data

Month	Uranium-233, -234 (07/14/92 - 08/14/92) Release (µCi)	Uranium-233, -234 (07/14/92 - 08/14/92) C Maximum (pCi/m³)	Uranium-238 (07/14/92 - 08/14/92) Release (µCi)	Uranium-238 (07/14/92 - 08/14/92) C Maximum (pCi/m³)
1991				
Year to Date	0.629 ± 0.233	0.0001 ± 0.0001	1.002 ± 0.235	0.0005 ± 0.0002
1992				
January	-0.1012 ± 0.014	0.0001 ± 0.0000	0.046 ± 0.016	0.0001 ± 0.0001
February	0.0407 ± 0.019	0.0001 ± 0.0000	0.115 ± 0.024	0.0004 ± 0.0001
March	0.036 ± 0.013[a]	0.0001 ± 0.0000	0.071 ± 0.013[a]	0.0007 ± 0.0002
April	0.039 ± 0.019[b]	0.0001 ± 0.0000	0.065 ± 0.020[b]	0.0001 ± 0.0000
May	c	c	c	c
June	c	c	c	c
July	c	c	c	c
August	c	c	c	c

[a] Ten locations missing because of incomplete laboratory analysis.
[b] Twelve locations missing because of incomplete laboratory analysis.
[c] Incomplete laboratory analysis.

Table 3

Tritium and Beryllium Airborne Effluent Data

Month	Tritium (H-3) (08/01/92 - 08/31/92) Release (μCi)	C Maximum (pCi/m³)	Beryllium (07/13/92 - 08/14/92) Release (grams)	C Maximum (μg/m³)
1991				
Year to Date	4.760	94 ± 55	1.2538 ± 0.083	0.00184
1992				
January	0.129	34 ± 9	0.0485 ± 0.011	0.00042
February	0.090	28 ± 15	0.0496 ± 0.009	0.00019
March	0.115	39 ± 7	[a]	
April	0.041	23 ± 5	[a]	
May	0.075	24 ± 7	[a]	
June	0.085	22 ± 5	[a]	
July	0.042	24 ± 6	[a]	
August		[b]		

NOTE: Beryllium measured at the remaining 44 locations was below the screening level of 0.1 gram per month. Beryllium emissions from Rocky Flats Plant are regulated by the State of Colorado under Colorado Air Quality Control Regulation #8. The limit for beryllium air emissions is 10 grams per stationary source in a 24-hour period.

The calibration methodology for the beryllium analyses was changed beginning with the September 1990 samples to improve quality assurance. The previous procedure used the single-point, "simple method of additions," one of the methods recommended by the manufacturer of the graphite furnace atomic absorption analytical equipment. The current method is based on EPA Contract Laboratory Program protocol. It uses multi-point calibration curves, periodic validation of the curve with EPA validation standards, and periodic blank and sample checks to assure absence of equipment contamination and matrix effects during the analysis. No blank corrections are made to any beryllium data.

[a] Incomplete laboratory analysis.
[b] Incomplete data analysis

2.2 Ambient

Ambient air samplers monitor plutonium concentrations in air in the surrounding environment. This monitoring is performed in accordance with DOE Order 5400.1. The data are used to determine the air-inhalation dose to the public for comparison with the DOE standard of 100 millirem per year effective dose equivalent from all modes of exposure from routine plant operations.

Samplers are designated in three categories by their proximity to the main facilities area. Twenty-five onsite samplers are located within RFP, generally downwind of RFP production facilities areas and near areas of known plutonium contamination. Fourteen perimeter samplers border RFP along major highways on the north (Highway 128), east (Indiana Street), south (Highway 72), and west (Highway 93) (Figure 2). Fourteen community samplers are located in metropolitan areas adjacent to RFP (Figure 3).

Samplers operate continuously at a volumetric flow rate of approximately 0.84 cubic meters per minute, collecting air particulates on 20- by 25-centimeter fiberglass filters. Manufacturer's test specifications rate this filter media to be 99.97 percent efficient for relevant particle sizes under conditions typically encountered in routine ambient air sampling.

Ambient air filters are collected biweekly and composited monthly by location before isotopic analysis. All routine ambient air filters are analyzed for plutonium-239 and -240.

Tables 4 through 6 summarize environmental monitoring data from the RFP ambient air sampling network.

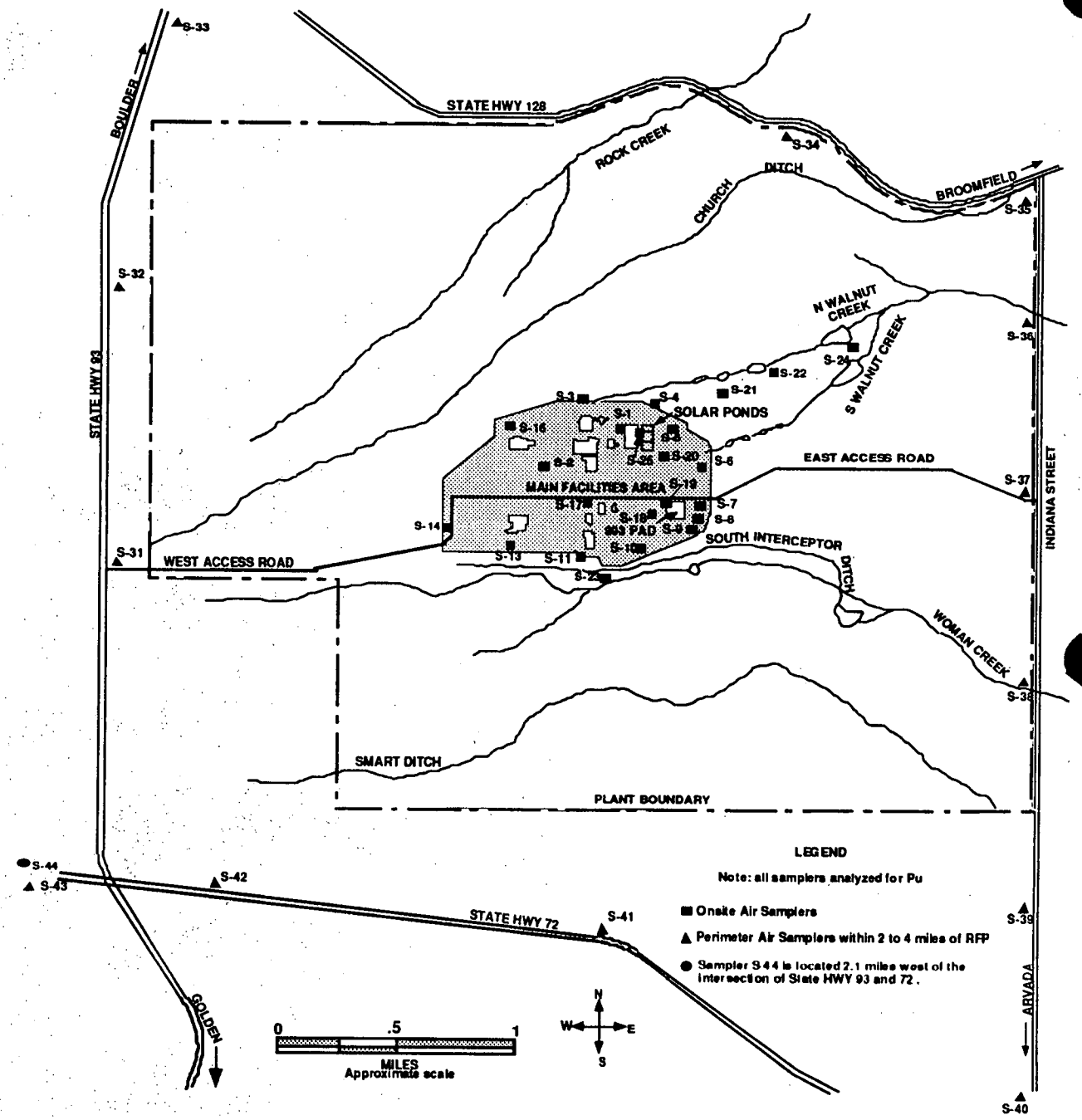


Figure 2: Location of Onsite and Perimeter Air Samplers

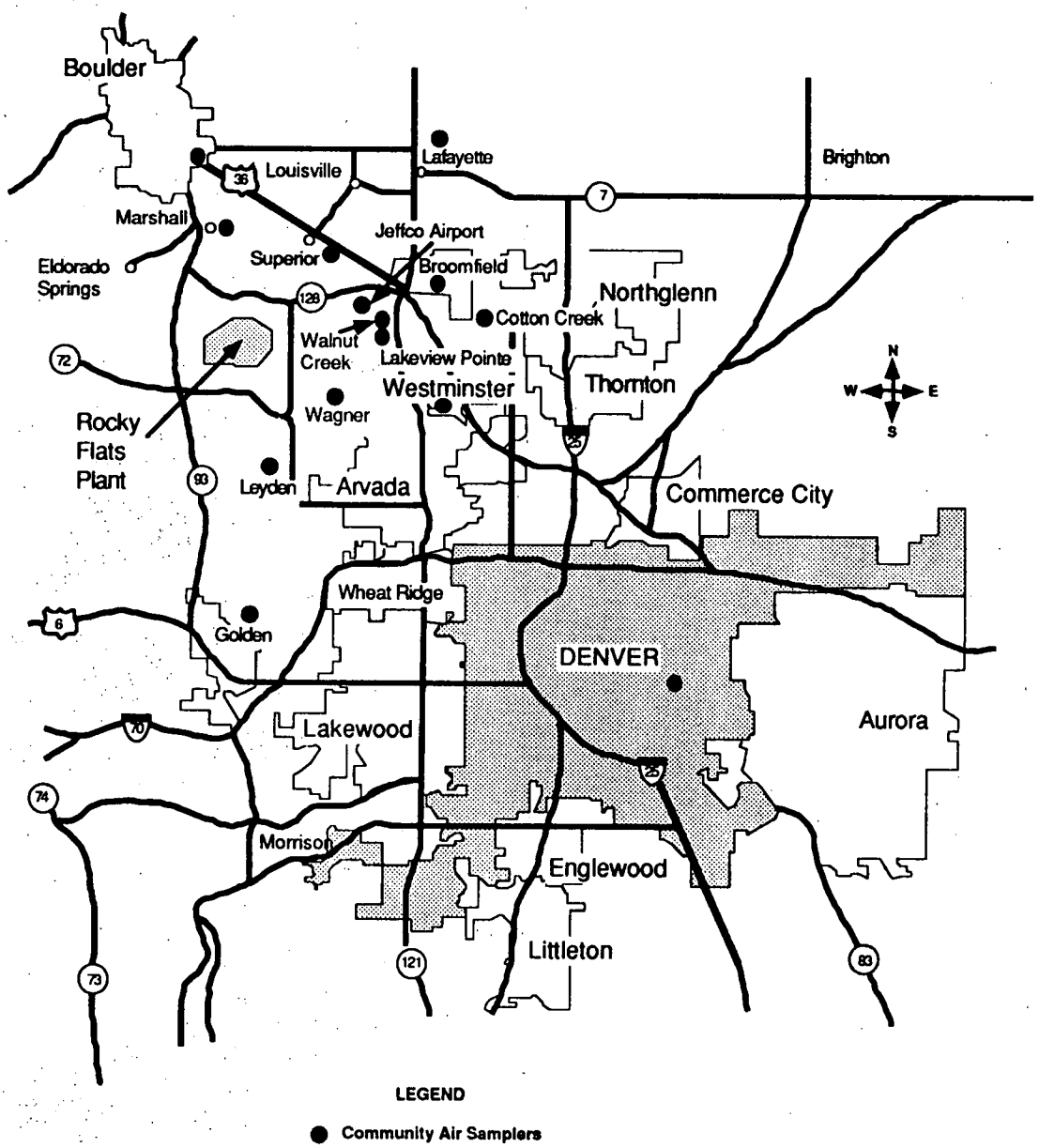


Figure 3: Location of Community Air Samplers

Table 4

Plutonium Concentrations in Ambient Air for Onsite Samplers

(07/20/92 - 08/31/92)

Location	Volume (m^3)	Plutonium Concentration (pCi/m^3)	± 95 percent Confidence Interval (pCi/m^3)
S-01[a]			
S-02[a]			
S-03[a]			
S-04[a]			
S-05[a]			
S-06[a]			
S-07[a]			
S-08[a]			
S-09[a]			
S-10[a]			
S-11[a]			
S-13[a]			
S-14[a]			
S-16[a]			
S-17[a]			
S-18[a]			
S-19[a]			
S-20[a]			
S-21[a]			
S-22[a]			
S-23[a]			
S-24[a]			
S-25[a]			
S-81[a]			

[a] Incomplete laboratory analysis.

Table 5

Plutonium Concentrations in Ambient Air for Perimeter Samplers

(07/28/92 - 08/25/92)

Location	Volume (m^3)	Plutonium Concentration (pCi/m^3)	± 95 percent Confidence Interval (pCi/m^3)
S-31[a]			
S-32[a]			
S-33[a]			
S-34[a]			
S-35[a]			
S-36[a]			
S-37[a]			
S-38[a]			
S-39[a]			
S-40[a]			
S-41[a]			
S-42[a]			
S-43[a]			
S-44[a]			

[a] Incomplete laboratory analysis.

Table 6

Plutonium Concentrations in Ambient Air for Community Samplers

(07/29/92 - 08/26/92)

Location	Community Name	Volume (m^3)	Plutonium Concentration (pCi/m^3)	± 95 percent Confidence Interval (pCi/m^3)
S-51[a]	Marshall			
S-52[a]	Jeffco Airport			
S-53[a]	Superior			
S-54[a]	Boulder			
S-55[b]	Lafayette			
S-56[a]	Broomfield			
S-57[b]	Walnut Creek			
S-58[a]	Wagner			
S-59[a]	Leyden			
S-60[a]	Westminster			
S-61[c]	Denver			
S-62[a]	Golden			
S-68[a]	Lakeview Pointe			
S-73[a]	Cotton Creek			

a Incomplete laboratory analysis.
b This sampler was damaged beyond repair and must be replaced.
c Sampler S-61 located in Denver was inoperative during this period. This sampler has been temporarily removed because of construction activities on the building where it is installed.

3. Water

3.1 Radionuclide

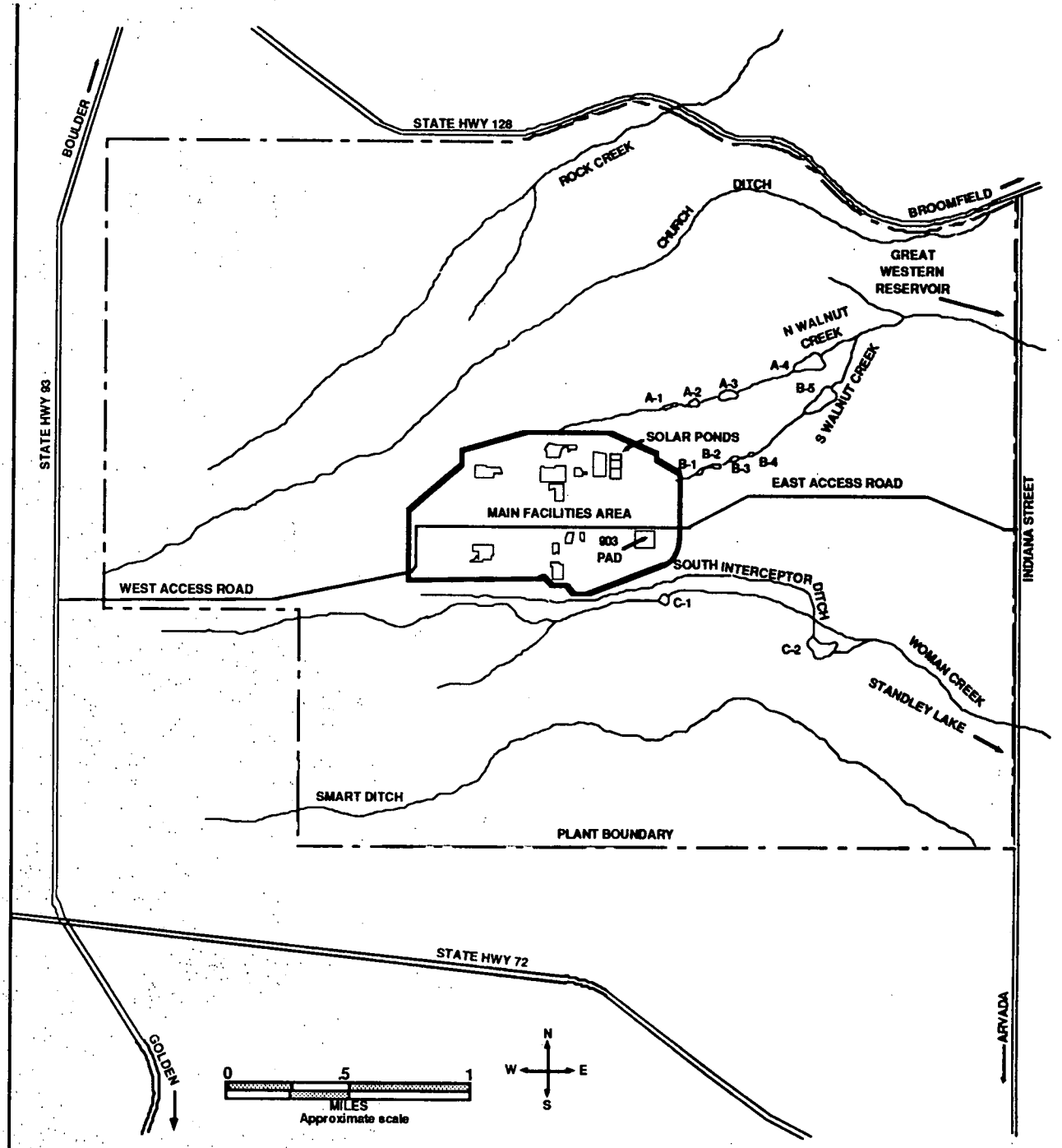
RFP samples for and analyzes radionuclides that may be present in the plant surface water control ponds, drinking water reservoirs, and tap water for neighboring communities. Radionuclide standards for discharge of surface water effluents are given in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." In addition, the Colorado Water Quality Control Commission has issued stream segment standards for drainages downstream of RFP. These standards address both radioactive and nonradioactive parameters.

Onsite water sampling is performed at several locations at RFP. These include ponds A-4, B-5, C-1, and C-2 as well as Walnut Creek at Indiana Street. Daily samples are collected during discharges or periods of flow for these locations, and composited into weekly samples. Analyses are then performed for plutonium, americium, and uranium isotopic concentrations.

Community water monitoring includes sampling and analysis of public water supplies and tap water from several surrounding communities. Great Western Reservoir, one of the water supplies for the city of Broomfield, and Standley Lake Reservoir, a water supply for the cities of Westminster, Thornton, and Northglenn, may receive run-off from RFP drainage systems (Walnut Creek and Woman Creek respectively). However, these drainage systems have been diverted by way of the Broomfield Division Ditch since 1990. The city of Federal Heights purchases a portion of its water supply from the city of Westminster. Weekly samples are collected and composited into monthly samples, and analyses are performed for plutonium, americium, and uranium isotopic concentrations. Tritium analyses are conducted on weekly grab samples.

Drinking water from Boulder, Broomfield, and Westminster is collected weekly, composited monthly, and analyzed for plutonium, americium, and uranium isotopic concentrations. Analyses for tritium are performed weekly. Quarterly tap water samples are collected from the communities of Arvada, Denver, Golden, Lafayette, Louisville, and Thornton. These samples are analyzed for plutonium, uranium, americium, and tritium.

Water sampling results for radioactive constituents are given in Tables 7 through 11.



Note: Stream flow in the Rocky Flats area is to the east.

Figure 4: Holding Pond and Liquid Effluent Water Courses

Table 7

Onsite Water Sample Results - Plutonium and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium-239, -240	Americium-241
Pond A-4 - No discharge		
Pond B-5 - No discharge		
Pond C-1		
08/24/92 - 08/28/92	a	a
08/29/92 - 09/04/92	a	a
Average concentration	a	a
Pond C-2 - No discharge		
Walnut Creek at Indiana		
08/25/92 - 08/26/92[b]	a	a
Volume weighted average concentration	a	a

a Incomplete laboratory analysis.
b Sample represents flow from precipitation.

Table 8

Onsite Water Sample Results - Uranium

Location	Holding Pond Outfall (pCi/l) Uranium-233, -234	Uranium-238
Pond A-4 - No discharge		
Pond B-5 - No discharge		
Pond C-1		
08/24/92 - 08/28/92	a	a
08/29/92 - 09/04/92	a	a
Average concentration	a	a
Pond C-2 - No discharge		
Walnut Creek at Indiana		
08/25/92 - 08/26/92[b]	a	a
Volume weighted average concentration	a	a

a Incomplete laboratory analysis.
b Sample represents flow from precipitation.

Table 9

Offsite Water Sample Results - Plutonium and Americium

Location	Number of Samples	Plutonium-239, -240[a]	Americium-241[a]
Reservoirs (pCi/l)			
Great Western	1[b]		
Standley Lake	1[b]		
Community Tap Water (pCi/l)[a]			
Boulder	1[b]		
Broomfield	1[b]		
Westminster	1[b]		

a Incomplete laboratory analysis.
b Plutonium and americium analyses were performed on one sample composited from four weekly grab samples.

Table 10

Offsite Water Sample Results - Uranium

Location	Number of Samples	Uranium-233, -234[a]	Uranium-238[a]
Reservoirs (pCi/l)			
Great Western	1[b]		
Standley Lake	1[b]		
Community Tap Water (pCi/l)[a]			
Boulder	1[b]		
Broomfield	1[b]		
Westminster	1[b]		

a Incomplete laboratory analysis.
b Uranium analyses were performed on one sample composited from four weekly grab samples.

Table 11

Onsite and Offsite Water Sample Results - Tritium

		Tritium (pCi/l)		
Location	Number of Samples	C Minimum[a]	C Maximum[a]	C Average[a]
Boulder	4			
Broomfield	4			
Great Western	4			
Standley Lake	4			
Westminster	4			
Walnut at Indiana[b]	2			

a Incomplete laboratory analysis.
b Volume weighted average concentration.

May Errata - Table 7

Onsite Water Sample Results - Plutonium and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium-239, -240			Americium-241		
Pond A-4						
05/23/92 - 05/29/92	0.000	±	0.002[a]	0.004	±	0.003[a]
05/30/92 - 06/05/92		[b]			[b]	
Volume weighted average concentration		[b]			[b]	
Pond B-5 - No discharge						
Pond C-1						
05/02/92 - 05/08/92	0.010	±	0.003	0.004	±	0.002
05/09/92 - 05/15/92		[b]		0.002	±	0.002[a]
05/16/92 - 05/22/92	0.025	±	0.008[a]	-0.001	±	0.002[a]
05/23/92 - 05/29/92	0.007	±	0.004[a]	0.001	±	0.002[a]
05/30/92 - 06/05/92		[b]			[b]	
Average concentration		[b]			[b]	
Pond C-2 - No discharge						
Walnut Creek at Indiana						
05/24/92 - 05/29/92	0.078	±	0.014[a]	0.032	±	0.006[a]
05/30/92 - 06/05/92		[b]			[b]	
Volume weighted average concentration		[b]			[b]	

[a] Previously reported as incomplete.
[b] Incomplete laboratory analysis

May Errata - Table 9

Offsite Water Sample Results - Plutonium and Americium

Reservoirs (pCi/l)

Location	Number of Samples	Plutonium-239, -240[a]	Americium-241[a]
Great Western	1[b]	0.005 ± 0.003	0.006 ± 0.005
Standley Lake	1[b]	0.001 ± 0.002	-0.005 ± 0.002

Community Tap Water (pCi/l)[a]

Boulder	1[b]	0.000 ± 0.002	-0.001 ± 0.004
Broomfield	1[b]	0.002 ± 0.002	-0.003 ± 0.003
Westminster	1[b]	0.001 ± 0.002	0.003 ± 0.005

a. Previously reported as incomplete.
b. Plutonium and americium analyses were performed on one sample collected 05/14/92.

June Errata - Table 7

Onsite Water Sample Results - Plutonium and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium-239, -240			Americium-241		
Pond A-4						
05/30/92 - 06/05/92	a			a		
Volume weighted average concentration	a			a		
Pond B-5 - No discharge						
Pond C-1						
05/30/92 - 06/05/92	a			a		
06/06/92 - 06/12/92	a			a		
06/13/92 - 06/19/92	a			a		
06/20/92 - 06/26/92	a			a		
06/27/92 - 07/ 03/92	0.023	±	0.003	0.005	±	0.002
Average concentration	a			a		
Pond C-2 - No discharge						
Walnut Creek at Indiana						
05/30/92 - 06/05/92	a			a		
Volume weighted average concentration	a			a		

a Incomplete laboratory analysis.

July Errata - Table 7

Onsite Water Sample Results - Plutonium and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium-239, -240			Americium-241		
Pond A-4						
07/11/92 - 07/17/92	0.000	±	0.001	-0.002	±	0.001
07/18/92 - 07/24/92		[a]			[a]	
Volume weighted average concentration		[a]			[a]	
Pond B-5 - No discharge						
Pond C-1						
07/04/92 - 07/10/92	0.016	±	0.003	0.006	±	0.002
07/11/92 - 07/17/92	0.019	±	0.003	0.006	±	0.002
07/18/92 - 07/24/92		[a]			[a]	
07/25/92 - 07/31/92		[a]			[a]	
Average concentration		[a]			[a]	
Pond C-2 - No discharge						
Walnut Creek at Indiana						
07/11/92 - 07/17/92	0.001	±	0.001	0.003	±	0.002
07/18/92 - 07/24/92		[a]			[a]	
Volume weighted average concentration		[a]			[a]	

[a] Incomplete laboratory analysis.

3.2 Nonradionuclide

RFP conducts sitewide surface water sampling programs to monitor discharges from detention ponds, evaluate potential contaminant releases, and characterize baseline water quality. For nonradioactive parameters requirements for this monitoring are derived from the RFP EPA National Pollutant Discharge Elimination System (NPDES) permit as modified in March 1991, by a Federal Facilities Compliance Agreement (FFCA). The NPDES/FFCA permit sets limits for nonradioactive pollutants in effluent water from federal facilities.

The EPA has issued to the RFP an NPDES permit for control of surface water discharges. The RFP NPDES permit establishes effluent limitations for seven surface water discharge points, which may discharge into drainages leading off of the RFP.

Nitrate monitoring for Great Western Reservoir and Standley Lake, the two drinking water reservoirs that may receive surface water discharges from the plant, are summarized in Table 12. Surface water discharges from RFP are currently being diverted around these drinking water reservoirs.

Water sampling results associated with the NPDES/FFCA permit are reported in Table 13. Applicable NPDES/FFCA limits are included in Table 13 for comparison. Monitoring results for which no limits have been established under the NPDES/FFCA are reported in Table 14. Analytical results for nonradioactive parameters in water at Walnut Creek at the Indiana Street location are summarized in Table 15.

Table 12

Offsite Water Sample Results - Nitrate as Nitrogen

Nitrate (as N) at Great Western Reservoir

Sample Date	Nitrate (as N) (mg/l)
08/06/92	0.00
08/13/92	0.07
08/20/92	0.05
08/27/92	<0.05

Nitrate (as N) at Standley Lake

08/06/92	0.18
08/13/92	0.10
08/20/92	0.11
08/27/92	<0.05

Note: For some nonradioactive parameters, the concentrations that are measured at or **below the Minimum** Detectable Concentration (MDC) are assigned to MDC. The less than symbol (<) indicates MDC values and calculated values that include one or more MDCs.

Table 13

NPDES/FFCA Permit Water Sample Results

Discharge 001-A (Pond B-3) Discharged continuously from 08/01/92 - 08/31/92.

Parameters		Measured 30-Day Average	Limit 30-Day Average	Measured Max. 7-Day Average	Limit Max. 7-Day Average
Nitrate	mg/l	3	10	4	20

		Measured Maximum	Limit Maximum
Total Residual Chlorine	mg/l	0.08	0.5

Discharge 001-B (Sewage Treatment Plant) Discharged continuously from 08/01/92 - 08/31/92.

Parameters		Measured 30-Day Average	Limit 30-Day Average	Measured Maximum	Limit Maximum
$CBOD_5$	mg/l	1.7	10	3.5	25
Total Phosphorus	mg/l	0.1	8	0.3	12
Total Chromium	mg/l	<0.003	0.05	<0.003	0.10

		Measured 30-Day Average	Limit 30-Day Average	Measured Max. 7-Day Average	Limit Max. 7-Day Average
Fecal Coliforms	#/100 ml	2 (Geometric)	200 (Geometric)	3 (Geometric)	400 (Geometric)
Total Suspended Solids	mg/l	5	30	6	45

		Measured Minimum	Limit Minimum	Measured Maximum	Limit Maximum
pH	SU	6.6	6.0	7.2	9.0

	Observed Sheen	Limit Sheen
Oil and Grease	No visual	No visual

Discharge 002 (Pond A-3) Discharged continuously from 08/01/92 - 08/05/92.

Parameters		Measured 30-Day Average	Limit 30-Day Average	Measured Maximum	Limit Maximum
Nitrates as N	mg/l	0.2	10	0.3	20

		Measured Minimum	Limit Minimum	Measured Maximum	Limit Maximum
pH	SU	7.8	6.0	8.2	9.0

Table 13

NPDES/FFCA Permit Water Sample Results (Continued)

Discharge 003 (RO Pilot Plant) and Discharge 004 (RO Plant) are inactive outfalls and will be eliminated from the new NPDES permit.

Discharge 005 (Pond A-4) No discharge.

Parameters		Measured Maximum	Limit Maximum
Total Chromium	mg/l		0.05

Discharge 006 (Pond B-5) No discharge.

Parameters		Measured 30-Day Average	Limit 30-Day Average	Measured Max. 7-Day Maximum	Limit Max. 7-Day Maximum
Nitrate as N[a]	mg/l	10		20	

		Measured Maximum	Limit Maximum
Total Residual Chlorine[a]	mg/l		0.5
Total Chromium	mg/l		0.05

Discharge 007 (Pond C-2) No discharge.

Parameters		Measured Maximum	Limit Maximum
Total Chromium	mg/l		0.05

a. These parameters are measured only in the event that Waste Water Treatment Plant effluent bypasses Pond B-3 and flows directly into Pond B-5.

Table 14

NPDES/FFCA Effluent Monitoring

Discharge 001-A (Pond B-3) Discharged continuously from 08/01/92 - 08/31/92.

Parameters		Measured Maximum	Measured 30-Day Average
BOD5	mg/l	9	6
CBOD5	mg/l	3	2
Total Suspended Solids	mg/l	5	4

Discharge 001-B (Sewage Treatment Plant [STP]) Discharged continuously from 08/01/92 - 08/31/92.

Parameters		Measured Maximum	Measured 30-Day Average
Nitrate as N	mg/l	8.28	4.16
Total Residual Chlorine	mg/l	0.09	0.01

Whole Effluent Toxicity[a] Sampled quarterly; data reported June 1992

Ceriodaphnia % Eff to LC_{50}:

Fathead Minnows % Eff to LC_{50}:

		Measured 30-Day Average
Metals		
Antimony	ug/l	<19.0
Arsenic	ug/l	<0.5
Beryllium	ug/l	<0.6
Cadmium	ug/l	<3.1
Copper	ug/l	<2.3
Iron	ug/l	120
Lead	ug/l	3.5
Manganese	ug/l	24.5
Mercury	ug/l	<0.2
Nickel	ug/l	<10
Silver	ug/l	<2
Zinc	ug/l	29

Metals were sampled on 08/12/92 and 08/26/92.

		PQL[b]	Concentrations that were above PQL	
Volatile Organic Compounds (VOCs)	ug/l			
Chloroform	ug/l	5	5	sampled 08/05/92
Chloroform	ug/l	5	6	sampled 08/19/92

Table 14

NPDES/FFCA Effluent Monitoring (Continued)

Discharge 003 (Reverse Osmosis Pilot Plant) and Discharge 004 (Reverse Osmosis Plant) are inactive outfalls and will be eliminated from the new NPDES permit.

Discharge 005 (Pond A-4) No discharge.

Whole Effluent Toxicity[a]

Ceriodaphnia	% Eff to LC_{50}:
Fathead Minnows	% Eff to LC_{50}:

Discharge 006 (Pond B-5) No discharge.

Whole Effluent Toxicity[a]

Ceriodaphnia	% Eff to LC_{50}:
Fathead Minnows	% Eff to LC_{50}:

Discharge 007 (Pond C-2) No discharge.

Whole Effluent Toxicity[a]

Ceriodaphnia	% Eff to LC_{50}:
Fathead Minnows	% Eff to LC_{50}:

a Results for whole effluent toxicity are given in percentage of effluent sample that will cause mortality to half the test result organisms within the time frame of the test. For example, >100 percent indicates that 100 percent pure effluent did not cause acute toxicity to at least half of the organisms. A lower percentage LC_{50} (lethal concentration to 50 percent of test organisms) indicates a greater toxic effect since less of the sample is required to observe a sufficiently extensive adverse effect.

b PQL is the Practical Quantitation Limit. It is equal to ten times the Method Detection Limit and represents the quantity at which 70 percent of laboratories can report in the 95 percent confidence interval.

Table 15

Water Sample Results, Nonradioactive Parameters

Walnut Creek at Indiana Street

Parameters		Number of Samples	C Minimum	C Maximum	C Average
pH	SU	2	7.2	7.6	N/A
Nitrates as N	mg/l	2	0.16	0.25	0.21

Flow was measured and samples collected from precipitation.

3.3 Flow

Daily flow data for surface water from the two plant drainage systems (Walnut Creek and Woman Creek) are given in Tables 16 and 17. The current NPDES/FFCA permit requires flow measurement for terminal ponds when discharged offsite (A-4, B-5, and C-2). Other flow data are reported for informational purposes.

Daily flow data for water transferred from Pond B-5 to Pond A-4, for subsequent discharge offsite, are given in Table 18. Meteorological data are given in Tables 19 and 20.

Table 16

Daily Flow Data Recorded at the Walnut Creek at Indiana Gaging Station, Ponds A-4 and B-5

Date	Walnut Creek at Indiana (Gallons)	Pond A-4 (Gallons)	Pond B-5 (Gallons)
08/01/92	No flow	No discharge	No discharge
08/02/92			
08/03/92			
08/04/92			
08/05/92			
08/06/92			
08/07/92			
08/08/92			
08/10/92			
08/11/92			
08/12/92			
08/13/92			
08/14/92			
08/15/92			
08/16/92			
08/17/92			
08/18/92			
08/19/92			
08/20/92			
08/21/92			
08/22/92			
08/23/92			
08/24/92	No flow		
08/25/92	418,000[a]		
08/26/92	444,000[a]		
08/27/92	No flow		
08/28/92			
08/29/92			
08/30/92			
08/31/92	No flow	No discharge	No discharge
Total	862,000	No discharge	No discharge

[a] Flow measurement is representative of precipitation.

Table 17

Daily Flow Data Recorded at Ponds C-1 and C-2 (Woman Creek)

Date	Pond C-1 (Gallons)	Pond C-2 (Gallons)
08/01/92	No flow	No discharge
08/02/92		
08/03/92		
08/04/92		
08/05/92		
08/06/92		
08/07/92		
08/08/92		
08/09/92		
08/10/92		
08/11/92		
08/12/92		
08/13/92		
08/14/92		
08/15/92		
08/16/92		
08/17/92		
08/18/92		
08/19/92		
08/20/92		
08/21/92		
08/22/92		
08/23/92	No flow	
08/24/92	371,000	
08/25/92	396,000	
08/26/92	274,000	
08/27/92	79,000	
08/28/92	40,000	
08/29/92	20,000	
08/30/92	17,000	
08/31/92	18,000	No discharge
Total	1,215,000	No discharge

Table 18

Daily Transfer Flow Data Recorded for Pond B-5 to Pond A-4

Date	Pond B-5 to Pond A-4 (gallons)
08/01/92	517,000
08/02/92	498,000
08/03/92	479,000
08/04/92	459,000
08/05/92	450,000
08/06/92	507,000
08/07/92	488,000
08/08/92	454,000
08/09/92	478,000
08/10/92	532,000
08/11/92	478,000
08/12/92	438,000
08/13/92	316,000
08/14/92	No transfer
08/15/92	
08/16/92	
08/17/92	
08/18/92	
08/19/92	
08/20/92	
08/21/92	
08/22/92	
08/23/92	
08/24/92	
08/25/92	
08/26/92	
08/27/92	
08/28/92	
08/29/92	
08/30/92	
08/31/92	No transfer
Total	6,094,000

4. Meteorology and Climatology

Meteorological data were collected on the plantsite during August 1992 from instrumentation installed on a 61-meter (200-foot) tower located in the west buffer zone. Meteorological information in this report represents over 99 percent data recovery. Table 19 is the August 1992 summary of the percent frequency of wind directions (16 compass points) divided into four wind-speed categories. The compass point designations indicate the true bearing when facing against the wind. These frequency values are represented graphically in the accompanying wind rose. The wind rose vectors also represent the bearing against the wind (i.e., wind along each vector blows toward the center).

Winds at RFP generally occur from the west through northwest, especially when speeds are greater than 3 m/s (6.7 mph). At lighter wind speeds less than 3 m/s (6.7 mph), the distribution of wind direction is more even. Wind speeds greater than 7 m/s (15.7 mph) from the east-southeast through south occur infrequently. The distribution of winds during August shows more frequent northerly and southeasterly winds, probably indicating thermally driven, daytime winds flowing up the South Platte River Basin and the Rocky Flats slope. Up-valley and up-slope winds are especially common during summer months when solar heating is strong.

August was much colder and wetter than normal. The month continued to experience unusually frequent and strong outbreaks of Canadian air masses for summer. The high temperature failed to reach 21 centigrade degrees (°C) (70 fahrenheit degrees [°F]) on 6 separate days during the month. Heavy rains on August 24 and 25 caused the daily high temperatures to reach only 12 °C (54 °F) and 15 °C (59 °F), respectively. The high temperature on August 24 was the coldest ever recorded during August at RFP. Meteorological measurements have been taken at RFP since 1953.

The mean wind speed during August was 3.2 m/s (7.3 mph). The peak gust during the month was 19 m/s (42 mph), which occurred on August 8. The mean temperature recorded for August was 18.2 °C (64.7 °F), or about 3.0 °C (5.5 °F) below normal. This was the second coldest August, and the summer of 1992 (June to August) was the coldest ever recorded at RFP.

Precipitation totalled 7.5 cm (2.97 in.) during August, or about 2.5 cm (1 in.) above normal. Most rain fell on August 23 through August 25, when 6.4 cm (2.50 in.) fell. The daily rainfall of 5.0 cm (1.97 in.) on August 24 was the heaviest in several years. The heavy rain resulted from the combination of the moisture associated with Hurricane Lester and a cold front causing upslope winds. The peak 15-minute rainfall of 0.71 cm (0.28 in.) fell on August 25. Annual precipitation has approached normal, equalling 31.0 cm (12.21 in.) through August.

Table 19

Rocky Flats Plant Wind Direction Frequency (Percent) by Four Wind-Speed Classes

(Fifteen-Minute Averages - August 1992)

	Calm	1-3 (m/s)	3-7 (m/s)	7-15 (m/s)	>15 (m/s)	Total
N	-	3.06	5.91	0.54	0.00	9.51
NNE	-	3.43	3.76	0.20	0.00	7.39
NE	-	2.52	2.45	0.00	0.00	4.97
ENE	-	2.02	0.94	0.00	0.00	2.96
E	-	2.99	0.71	0.00	0.00	3.70
ESE	-	2.86	1.28	0.00	0.00	4.14
SE	-	3.16	1.68	0.00	0.00	4.84
SSE	-	2.89	2.52	0.03	0.00	5.44
S	-	2.15	1.75	0.00	0.00	3.90
SSW	-	2.22	1.58	0.03	0.00	3.83
SW	-	2.65	2.72	0.10	0.00	5.47
WSW	-	2.99	5.98	0.27	0.00	9.24
W	-	4.67	3.93	0.10	0.00	8.70
WNW	-	4.87	2.96	0.34	0.00	8.17
NW	-	3.46	3.97	0.13	0.00	7.56
NNW	-	3.29	5.07	0.30	0.00	8.66
TOTAL	1.51	49.23	47.21	2.04	0.00	100.00

Table 20

Climatic Summary

	TEMPERATURE AND DEWPOINT				WIND SPEED		PRECIPITATION		PRESSURE
Date	High (°F)	Low	Mean	Dew-point	Mean (mph)	Maximum (1 sec)	Total Inches	Maximum (15 min)	Actual Mean (Millibars)
8/01/92	81.1	54.9	68.0	41.0	7.8	28.6	0.00	0.00	820
8/02/92	82.8	61.7	72.3	42.6	6.7	32.7	0.00	0.00	820
8/03/92	74.8	54.7	64.8	46.6	7.2	34.9	0.01	0.01	818
8/04/92	85.1	51.8	68.5	45.1	7.8	42.3	0.00	0.00	816
8/05/92	77.0	54.7	65.9	46.8	7.8	25.5	0.00	0.00	818
8/06/92	77.0	61.7	69.4	42.8	9.4	27.7	0.00	0.00	815
8/07/92	86.2	62.4	74.3	40.8	7.6	22.1	0.00	0.00	816
8/08/92	83.8	59.0	71.4	45.7	7.6	41.6	0.10	0.07	818
8/09/92	88.0	68.0	78.0	44.6	8.7	25.7	0.00	0.00	820
8/10/92	75.9	57.7	66.8	47.5	10.3	31.8	0.00	0.00	822
8/11/92	72.1	55.2	63.7	47.5	7.2	23.0	0.00	0.00	821
8/12/92	63.5	48.2	55.9	46.8	7.8	19.2	0.16	0.04	822
8/13/92	73.9	50.0	62.0	43.0	6.0	19.0	0.00	0.00	820
8/14/92	77.0	49.8	63.4	43.3	7.4	26.8	0.00	0.00	822
8/15/92	83.8	56.7	70.3	40.1	6.9	22.6	0.00	0.00	820
8/16/92	75.9	53.6	64.8	43.3	7.6	26.2	0.01	0.01	817
8/17/92	65.8	51.1	58.5	45.3	6.5	27.3	0.16	0.09	819
8/18/92	72.7	49.8	61.3	44.6	5.4	15.7	0.00	0.00	820
8/19/92	81.0	52.2	66.6	40.8	7.2	21.3	0.00	0.00	819
8/20/92	85.1	62.6	73.9	40.5	6.3	23.5	0.00	0.00	817
8/21/92	79.2	54.1	66.7	45.3	6.7	23.7	0.01	0.01	816
8/22/92	84.7	56.1	70.4	45.3	7.2	31.5	0.02	0.01	812
8/23/92	70.9	51.4	61.2	50.9	7.2	25.1	0.25	0.11	812
8/24/92	53.6	45.7	49.7	52.3	6.0	12.5	1.97	0.10	816
8/25/92	58.5	45.1	51.8	43.5	7.2	23.7	0.28	0.28	819
8/26/92	63.1	43.5	53.3	34.7	7.4	20.1	0.00	0.00	820
8/27/92	75.6	48.9	62.3	27.1	6.3	20.1	0.00	0.00	820
8/28/92	80.8	60.3	70.6	25.5	6.9	23.0	0.00	0.00	817
8/29/92	72.7	50.9	61.8	32.4	7.2	29.1	0.00	0.00	817
8/30/92	67.6	48.4	58.0	37.2	7.4	23.7	0.00	0.00	817
8/31/92	70.5	50.2	60.4	36.7	6.9	36.9	0.00	0.00	814

	MONTHLY TEMPERATURES				WIND SPEED		PRECIPITATION		PRESSURE
	Mean High (°F)	Mean Low	Mean	Mean Dew-point	Mean (mph)	Monthly Maximum	Total	Monthly Maximum	Monthly Average
	75.5	53.9	64.7	42.2	7.3	42.3	2.97	0.28	818

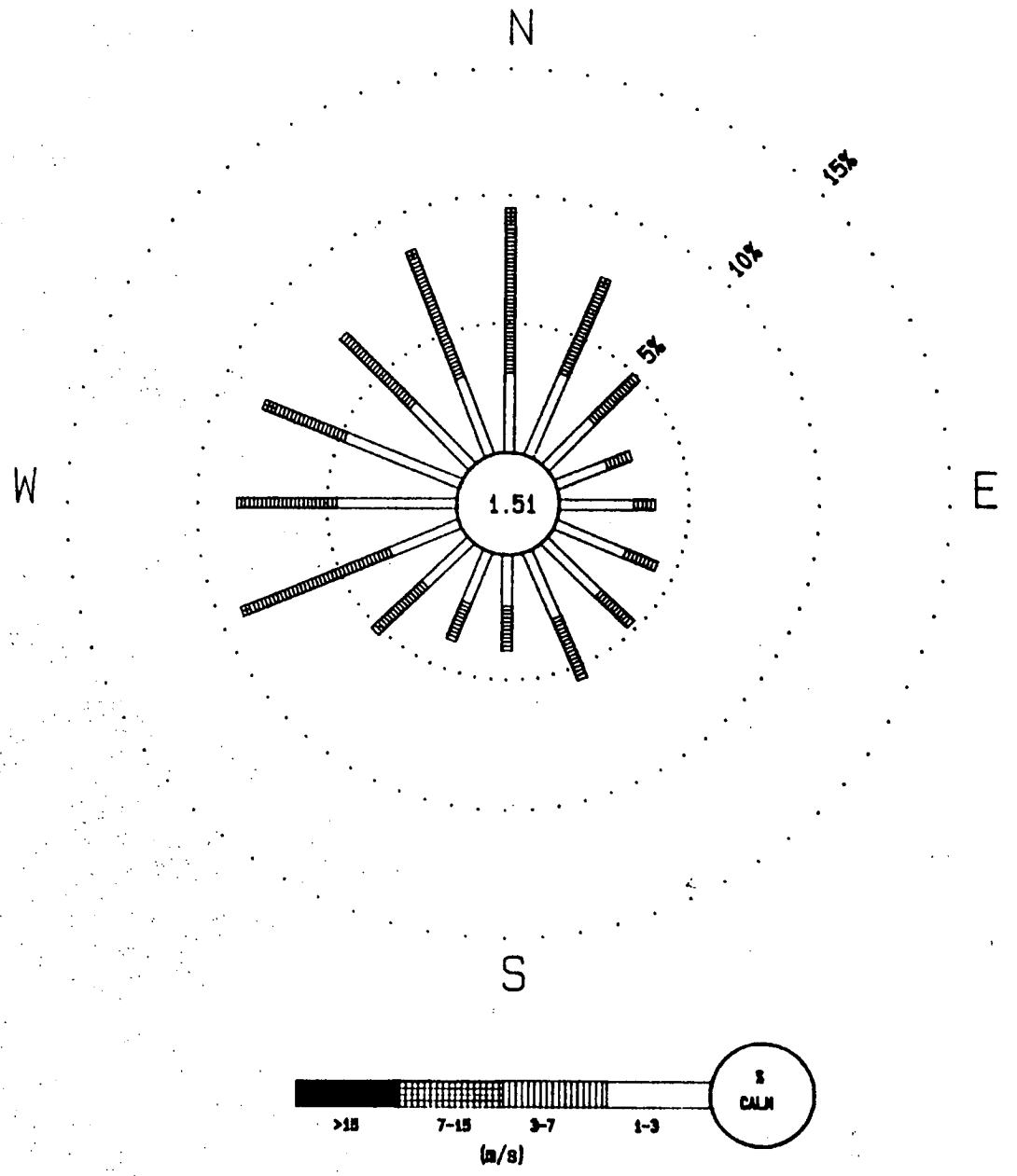


Figure 5: Wind Rose for the Rocky Flats Plant - August 1992

Appendix A

Radiation Standards for Protection of the Public

Calculation of Potential Plant Contribution to Public Radiation Dose

The primary standards for protection of the public from radiation are based on radiation dose. Radiation dose is a means of quantifying the biological damage or risk of ionizing radiation. The unit of radiation dose is the rem or the millirem (1 rem = 1,000 mrem). Radiation protection standards for the public are annual standards, based on the projected radiation dose from a year's exposure to or intake of radioactive materials.

Radiation dose is a calculated value. It is calculated by multiplying radioactivity concentrations in air and water or on contaminated surfaces by assumed intake rates (for internal exposures) or by exposure times (for external exposure to penetrating radiation), then by the appropriate radiation dose conversion factors. That is:

Radiation Dose = Radioactivity Concentration x Intake Rate/Exposure Time x Dose Conversion Factor

Radioactivity concentrations can be determined either by measurements in the environment or by calculations using computer models. These computer models perform airborne dispersion/dose modeling of measured building radioactivity effluents and estimated diffuse source term emissions (e.g., from resuspension from contaminated soil areas).

Assumed intake rates and dose conversion factors used are based on recommendations of national and international radiation protection advisory organizations, such as the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

Radioactive materials of importance in calculating radiation dose to the public from Rocky Flats Plant (RFP) activities include plutonium, uranium, americium, and tritium. Alpha radiation emissions from plutonium, uranium, and americium are primary contributors to the projected radiation dose.

DOE Radiation Protection Standards for the Public

ICRP-Recommended Standards for all Pathways:

Temporary Increase - 500 mrem-year Effective Dose Equivalent (with prior approval of DOE EH-2)

Normal Operations - 100 mrem/year Effective Dose Equivalent

EPA Clean Air Act Standards for the Air Pathway Only:

10 mrem-year Effective Dose Equivalent

DOE Derived Concentration Guides for Radionuclides of Interest at the Rocky Flats Plant

Air Inhalation:

Radionuclide	DCG (pCi/m3)
Plutonium-239, -240	0.02

Water Ingestion:

Radionuclide	DCG (pCi/l)
Plutonium-239, -240	30
Americium-241	30
Uranium-233, -234	500
Uranium-238	600
Hydrogen-3 (Tritium)	2,000,000

DOE Derived Concentration Guides

Potential public radiation dose commitments, which could have resulted from plant operations and from background (i.e., non-Plant) contributions, are calculated from average radionuclide concentrations measured at the Department of Energy (DOE) property boundary and in surrounding communities. Inhalation and water ingestion are the principal potential pathways of human exposure.

On February 8, 1990, DOE adopted DOE Order 5400.5, "Radiation Protection of the Public and the Environment," a radiation protection standard for DOE environmental activities (US 90). This standard incorporates guidance from the International Commission on Radiological Protection (ICRP), as well as from the Environmental Protection Agency Clean Air Act air emission standards (as implemented in 40 CFR 61, Subpart H). Included in DOE Order 5400.5 is a revision of the dose limits for members of the public. Tables of radiation dose conversion factors currently used for calculating dose from intakes of radioactive materials were issued in July 1988 (US88a, US88b). The dose factors are based on the ICRP Publications 30 and 48 methodology and biological models for radiation dosimetry. The DOE Order 5400.5 and the dose conversion factor tables are used for assessment of any potential RFP contribution to public radiation dose. On December 15, 1989, EPA published revised Clean Air Act air emission standards for DOE facilities (US89). DOE radiation standards for protection of the public are given in this Appendix and include the December 15, 1989, EPA Clean Air Act air pathway standards.

Secondary radioactivity concentration guides can be calculated from the primary radiation dose standards and used as comparison values for measured radioactivity concentrations. DOE provides tables of these "Derived Concentration Guides" - in Order 5400.5. Derived Concentration Guides (DCGs) are the concentrations that would result in an effective dose equivalent of 100 mrem from one year's chronic exposure or intake. In calculating air inhalation DCGs, DOE assumes that the exposed individual inhales 8,400 cubic meters of air at the calculated DCG during the year. Ingestion DCGs assume a water intake of 730 liters at the calculated DCG for the year. The table on page 40 lists the most restrictive air and water DCGs for the principal radionuclides of interest at the RFP.

Compliance with EPA Clean Air Act Standards

To determine compliance with the EPA air emissions standards, measured airborne effluent radioactivity emissions are entered into the EPA-approved atmospheric dispersion/dose calculation computer model, AIRDOS-PC, for calculation of the maximum radiation dose that an individual in the public could receive from the air pathway only.

For comparison with the annual radiation dose standards for protection of the public, the maximum annual effective dose equivalent that a member of the public could receive as a result of RFP activities is typically less than 1 mrem, or less than 1 percent of the recommended annual standard for all pathways.

Dose Equivalent and Effective Dose Equivalent (EDE)

Dose equivalent is a calculated value used to quantify radiation dose; it reflects the degree of biological effect from ionizing radiation. Differences in the biological effect of different types of ionizing radiation (e.g., alpha, beta, gamma, or x-rays) are accounted for in the calculation of dose equivalent.

EDE is a calculated value used to allow comparisons of total health risk (based primarily on the risk of cancer mortality) from exposures of different types of ionizing radiation to different body organs. It is calculated by first calculating the dose equivalent to those organs receiving significant exposures, multiplying each organ dose equivalent by a health risk weighting factor, and then summing those products. One millirem EDE from natural background radiation would have the same health risk as one millirem EDE from an artificially produced source of radiation.

References

US88a DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," United States Department of Energy, Asst. Secretary for Environment, Safety and Health, July 1988.

US88b DOE/EH-0071, "Internal Dose Conversion Factors for Calculation of Dose to the Public," United States Department of Energy, Asst. Secretary of Environment, Safety and Health, July 1988.

US89 United States Environmental Protection Agency, Code of Federal Regulations 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities," Washington, D.C., December 15, 1989.

US90 United States Department of Energy, DOE Order 5400.5, "Radiation Protection of the Public and the Environment," Washington, D.C., February 8, 1990.

Appendix B

National Pollutant Discharge Elimination System/Federal Facilities Compliance Agreement Volatile Organic Compounds

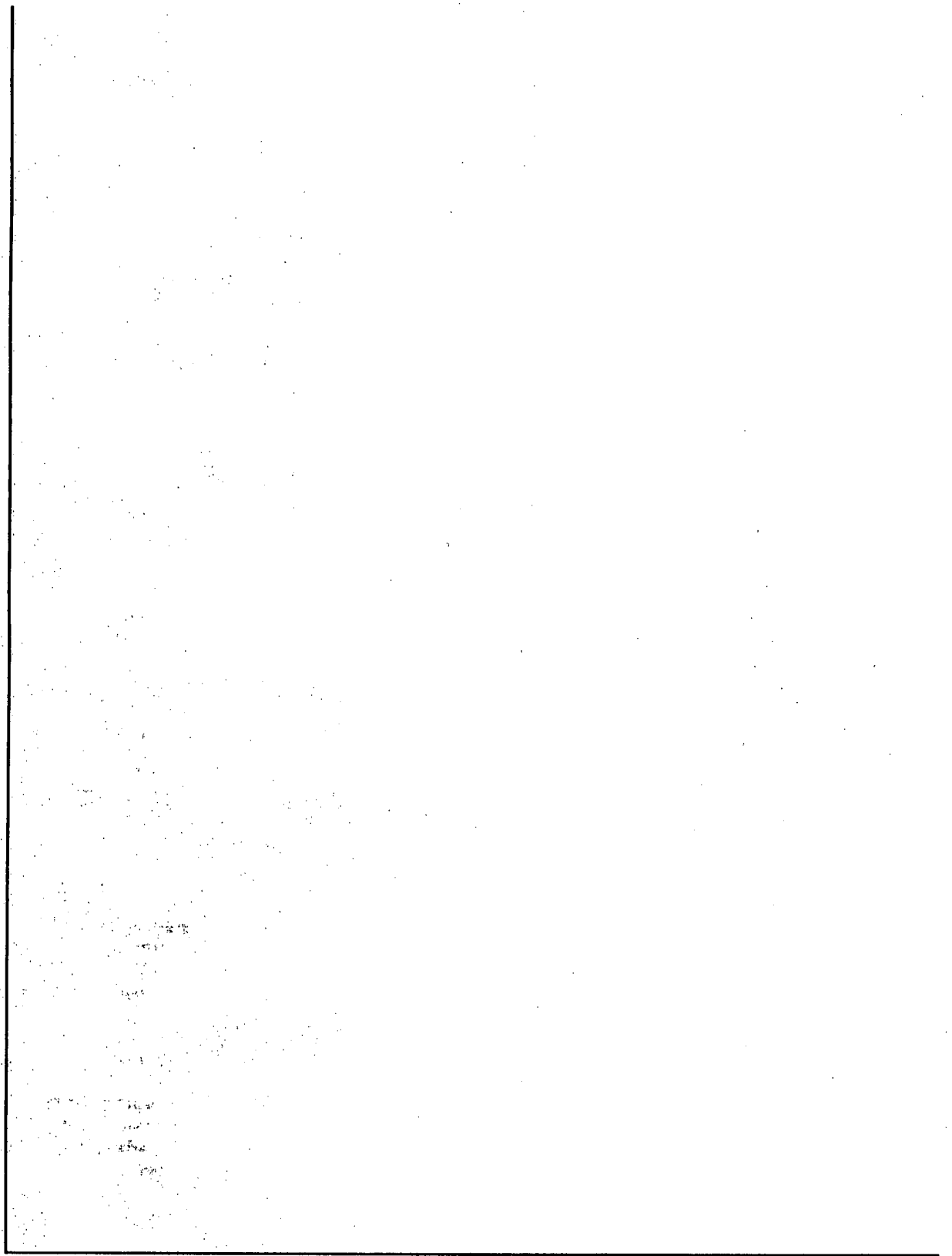
The following is a list of volatile organic compounds (VOCs) for which monitoring is required by the Environmental Protection Agency National Pollutant Discharge Elimination System/Federal Facilities Compliance Agreement (NPDES/FFCA).

Compound	PQL (µg/l)	Compound	PQL (µg/l)
Benzene	5	1,3-dichloropropylene	5
Bromoform	5	Ethylbenzene	5
Methyl bromide	10	Methyl chloride	10
Carbon Tetrachloride	5	Methylene chloride	5
Chlorobenzene	5	1,1,2,2-tetrachloroethane	5
Chlorodibromomethane	5	Tetrachloroethylene	5
Chloroethane	10	Toluene	5
Chloroform	5	1,2-trans-dichloroethylene	5
Dichlorobromomethane	5	1,1,1-trichloroethane	5
1,1-dichloroethane	5	1,1,2-trichloroethane	5
1,2-dichloroethane	5	Trichloroethylene	5
1,1-dichloroethylene	5	Vinyl chloride	10
1,2-dichloropropane	5		

Appendix C

Colorado Water Quality Control Commission Standards

The Colorado Water Quality Control Commission has promulgated new standards for the Walnut Creek and Woman Creek drainages downstream from the Rocky Flats Plant. The Environmental Protection Agency has not yet written a new National Pollutant Discharge Elimination System permit that reflects these standards; however, in the spirit of the Agreement in Principle completed between the Department of Energy and the State of Colorado, the plant is attempting to meet the standards at this time.



Appendix D

Distribution

Federal Agencies

US DOE, RFO
Attn: T.A. Vaeth
Bldg. 115

US EPA
Attn: Dr. M. Lammering,
R. Rutherford
One Denver Place - Suite 1300
999 18th Street
Denver, CO 80202-2413

US EPA
Attn: B. Lavelle
999 18th Street, Suite 500
8 HWM-FF
Denver, CO 80202-2405

State Government Agencies

Colorado Water Conservation Board
Attn: N.C. Ioannides
823 State Centennial Building
1313 Sherman Street
Denver, CO 80203

Denver Regional Council of Governments
Attn: L. Mugler
2480 W. 27th Avenue, #200B
Denver, CO 80211

Department of Natural Resources
Attn: B. Hamlett III
1313 Sherman Street
Denver, CO 80203

Rocky Flats Environmental Monitoring Council
Attn: G. Swartz
1536 Cole Blvd., Suite 325
Denver West Office Park #4
Golden, CO 80401

City Governments

City of Arvada
Utilities Division
Attn: M. Mauro
8101 Ralston Road
Arvada, CO 80002

City of Boulder
Office of the City Manager
Attn: J. Piper, A. Struthers
P.O. Box 791
Boulder, CO 80302

City of Broomfield
Attn: H. Mahan, K. Schnoor
#6 Garden Office Center
P.O. Box 1415
Broomfield, CO 80038-1415

City of Fort Collins
Office of the City Manager
Attn: S. Burkett
300 La Porte
Fort Collins, CO 80525

City of Northglenn
Attn: T. Ambalam
11701 Community Center Drive
Northglenn, CO 80233-1099

City of Thornton
Attn: J. Ethredge, City Manager
9500 Civic Center Drive
Thornton, CO 80229-1120

City of Westminster
Attn: W. Christopher, S. Ramer
4800 W. 92nd Avenue
Westminster, CO 80030

Denver Water Department
Quality Control
Attn: J. Dice
1600 W. 12th Avenue
Denver, CO 80254

Health Departments

Boulder City/County Health Department - Division of Environmental Health
Attn: T. Douville, V. Harris
3450 Broadway
Boulder, CO 80020

Colorado Department of Health
4210 E. Eleventh Avenue
Denver, CO 80020
Attn: J. Berardini, J. Bruch, R. Fox, P. Frohardt, D. Holme, J. Jacobi, E. Kray, A. Lockhart, P. Nolan R. Quillin, J. Sowinski, R. Terry,

Jefferson County Health Department
Attn: Dr. M. Johnson, C. Sanders
260 South Kipling
Lakewood, CO 80226

Tri County District Health
Attn: S. Salyards
4301 E. 72nd Avenue
Commerce City, CO 80022

Environmental

Advance Sciences, Inc.
Attn: D. Kaskie, M.G. Waltermire
405 Urban Street, Suite 401
Lakewood, CO 80228

American Friends Service Co.
Attn: T. Rauch
1535 High Street, 3rd Floor
Denver, CO 80218

Doty and Associates
F.H. Blaha
2303 Table Heights Drive
Golden, CO 80401

Environmental Information Network
Attn: P. Elofson-Gardine
8470 W. 52nd Place, Suite 9
Arvada, CO 80002-3447

IT Corporation
Attn: C. Rayburn
5600 S. Quebec, Suite 280D
Englewood, CO 80111

L.C. Holdings
Attn: M. Jones
18300 Hwy 72
Golden, CO 80403-8222

Margie Reynolds
8882 Comanche Drivet
Longmont, CO 80503-8657

National Renewable Energy Laboratory
Attn: R. Noun
1617 Cole Blvd.
Golden, CO 80402

PRC Environmental Management, Inc.
Attn: R.J. Fox
1099 18th Street, Suite 1960
Denver, CO 80202

Peak Rock Spring Water
Attn: S. Dolson
4615 Broadway Street
Boulder, CO 80304-0509

Rocky Flats Cleanup Commission
Attn: K. Korkia
1738 Wynkoop, Suite 302
Denver, CO 80202

Sierra Club - Rocky Mountain Chapter
Attn: Dr. E. DeMayo
11684 Ranch Elsie Road
Golden, CO 80203

W. Gale Biggs Associates
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P.O. Box 3344
Boulder, CO 80307

Woodward Clyde/ERCE
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Stanford Place 3, Suite 415
4582 S. Ulster Street Pkwy.
Denver, CO 80237

Wright Water Engineers
Attn: J. Jones, S. Kribs
2490 W. 26th Avenue, Suite 100A
Denver, CO 80211

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National Center for Atmospheric Research
Attn: S. Sadler
P.O. Box 3000
Boulder, CO 80307-3000

Physicians for Social Responsibility
Attn: T. Perry
1000 16th NW, Suite 810
Washington, D.C. 20036

R.M. Borinsky
13004 Lowell Court
Broomfield, CO 80020

R.D. Morgenstern
3213 W. 133rd Avenue
Broomfield, CO 80020

J.K. Natale
11767 W. 74th Way
Arvada, CO 80005

L.S. Newton
5993 W. 75th Avenue
Arvada, CO 80003

F.H. Shoemaker
13631 W. 54th Avenue
Arvada, CO 80002

D.L. Weiland
7648 Owens Court
Arvada, CO 80005

EG&G Rocky Flats

Rocky Flats Plant Public Reading Room
c/o Front Range Community College
3645 W. 112th Avenue
Westminster, CO 80037

S.K. Andrews, Surface Water Division

B.M. Bowen, Air Quality & Chemical Tracking Division

E.A. Brovsky, General Chemistry

M.S. Brugh, Gen. Spect. Laboratory

S.A. Buckie, Op. Health Physics

D.A. Cirrincione, Environmental Publications & Communications Branch

D.B. Costain, Environmental Publications & Communications Branch

J.A. Cuicci, Liquid Waste

S.L. Cunningham, Info. Security

N.M. Daugherty, Air Quality & Chemical Tracking Division

N.S. Demos, Earth Resources Division

J.R. Dick, Analytical Labs

L.A. Doerr, Op. Health Physics

L.A. Dunstan, Surface Water Division

G.D. Elliott, FPM Program Management

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N.L. Erdmann, Environmental Publications & Communications Branch

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B.J. Pauley, Air Quality & Chemical Tracking Division

V.L. Peterson, Safety Analysis & Risk Assessment

D.R. Pierson, Pondrete Ops.

F. Primozic Waste Quality Engineering

A.J. Read, Radiological Health Laboratory

R.S. Roberts, Remediation Programs Division

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